predictor of superscans without requiring computer analysis. By the same token early detection of abnormal bone uptake may facilitate the prospective selection of cases where more extensive workup is warranted. The finding can be regarded as an added incentive to the inclusion of an early renal view in the bone scan procedure.

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Computer Analysis of Radionuclide Esophageal Transit Studies

TO THE EDITOR: We read with interest the paper "Computer Analysis of Radionuclide Esophageal Transit Studies" by Klein and Wald (*1*), and there are some methodological aspects described in the paper that we would like to comment on.

The calculation of mean transit time (MTT) using area to height ratio implies the calculation of the area from the beginning of the swallowing until all the activity is cleared from the region of interest (*2*). By calculating the MTT from only the rapid component, the authors assumed that the residual component was an artifact and they have given the possible causes of this artifact.

This assumption is not valid in patients with esophageal transit abnormalities. As a matter of fact, in patient with a slightly or moderately prolonged esophageal transit time, the swallowed dose is often separated in two parts, one part passes through the esophagus rapidly (the rapid component) and the other remains often in the esophagus for a longer period (the slow component). In patient with a severe transit delay such as in achalasia, the whole dose may remain in the esophagus for quite a long time and there is no more rapid component. The "residual" activity observed in these cases is not artifactual but rather represents the impairment of the esophageal transit. By removing this activity, the MTT becomes artificially normal.

Our second comment concerns the centroid analysis which is indeed a very interesting technique. We would like to add, however, that the application of this principle on the temporal distribution of the radioactivity instead of its spatial distribution will give a better idea on regional esophageal transit. Indeed, the calculation of the ratio of first and zeroth moments of the pixel to pixel time activity curves allows to obtain the distribution of the mean time (*3*).

On one point, we are in total agreement with Klein and Wald. It concerns the condensed image which in our experience also constitutes the best display for the qualitative assessment of esophageal transit study (*4*).

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REPLY: We thank Ham and Piepsz for their comments concerning our methodology for the analysis of esophageal transit studies (*1,2*).

When studying the fate of a swallow of radioactive liquid, one acquires a record of the distribution of particles in space and time. A logical approach to quantitation is one which leads to computation of a transit time which is specifically the mean for the many heterogeneously behaving particles. The record upon which the computation is based must therefore be one which specifically accounts for all the individual transit times contributing to the desired mean. The problem, as exemplified by the first-swallow, whole-esophagus, time-activity curves that we have used, is that the curves may not descend to zero during the time interval under study. One may deal with the remaining particles by a curve stripping procedure, as we have done, or by extrapolation. To compute mean transit time (MTT) without such a treatment is to assume that the curve drops to zero in a sudden final step, and the result will obviously be invalid.

We have observed that our curves descend to a late plateau value which remains nearly constant before a second swallow ensues. Extrapolation to infinity would preserve the constant plateau value and lead to an infinite MTT, which would not